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PROGRESS REPORT ON RESEARCH AND RELATED SERVICE  
APPLICABLE TO  
→ WOOL

Including Work in United States Department of Agriculture  
and Certain State Work Financed in Part with  
Agricultural Marketing Act Funds

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Prepared for Use in Connection with the  
October 1955 Meeting of the  
Wool Advisory Committee

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This progress report is a "tool" for: (1) administrative use in program development, coordination and evaluation; (2) advisory committee use in formulation of recommendations in regard to present and future programs. The material in the report is not for publication. Included are many tentative or indicated findings that have not been sufficiently tested for public release. As soon as these results are ready for release, the information will be released promptly through established channels. The report also includes research findings that have already been released. The publications containing the public release are cited. Public reference to the findings that have been released should mention the publication in which the release was made, NOT this progress report.

For the reasons given, copies of this report are available only to research administrators and workers directly concerned with the development and conduct of the program and to advisory committee members. Those receiving it are asked to observe strictly the limitation: "Administratively Confidential -- Not to be quoted or copied."

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UNITED STATES DEPARTMENT OF AGRICULTURE  
Washington, D. C.  
October 1955

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## FUNCTIONS OF ADVISORY COMMITTEES

The Wool Research and Marketing Advisory Committee is one of a number of committees authorized by Congress in 1946 to advise the Department of Agriculture with respect to specific research and service programs.

The committees have been asked to consider all of the research and marketing service work of the Department in their respective fields. This is in recognition of the value the Department places upon the advice and counsel received and is in accord with suggestions of Congressional committee members who are directly concerned with the work.

These committees are performing an important function in advising with respect to the development of the Department's research and marketing service programs. However, it is recognized that the implementing and administering of these programs are the responsibility of the Department

The functions of the advisory committeemen include:

1. Acquainting themselves with the problems of producers, all segments of the industry and of other groups, and presenting them for committee consideration.
2. Reviewing and evaluating the current research and marketing service programs of the Department, including work under way at Federal laboratories and field stations.
3. Recommending adjustments in the Department's program, including priorities for new work and expansion of work under way.
4. Developing a better understanding of the nature and value of the agricultural research program, explaining it to interested persons, groups and organizations and encouraging the wider and more rapid application of the findings of research.

## COOPERATION

Much of the research on wool covered in this report is conducted in cooperation between agencies of the United States Department of Agriculture and the State experiment stations. The studies find their origin in problems of producers, processors, distributors and consumers, and representatives of these groups frequently participate in the cooperation. Cooperative programs are jointly planned and conducted in a manner to make full use of the personnel and resources of each participating group with the minimum of duplicative effort. The results of cooperative research are jointly prepared in the form of uniform recommendations.



THE  
FEDERAL GOVERNMENT  
OF CANADA  
DEPARTMENT OF THE ARMY  
OFFICE OF THE CHIEF OF DEFENSE STAFF  
OTTAWA, ONTARIO  
K1P 5K5

MEMORANDUM  
TO: THE CHIEF OF DEFENSE STAFF  
FROM: THE CHIEF OF THE ARMY  
SUBJECT: [Illegible]

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PROGRESS REPORT  
for  
WOOL RESEARCH AND MARKETING  
ADVISORY COMMITTEE

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PROGRESS REPORT  
for  
WOOL RESEARCH AND MARKETING  
ADVISORY COMMITTEE MEETING  
October 24-25, 1955

I. PRODUCTION

A. Animal and Poultry Husbandry Research Branch - ARS

1. Roving and Yarn Evaluated from Single Fleeces

Processing research involving fiber assembly properties of roving and yarn produced from different lots of top was carried out under a contract with the Lowell Technological Institute Research Foundation. Each lot represented the main fleece matching from an individual Targhee yearling ewe. The major portion of this contract work was devoted to the development of methodology and testing techniques which would adequately measure the parameters being tested.

The evaluation of fibers and yarns from four Targhee test fleeces (in conjunction with a control for future compilation of additional evaluations) provided reasonable assurance that each of the test fleeces represented a different population. Each fleece differed significantly one from another at both fiber and yarn levels in the mean values and/or variance values for the yarn characteristics previously found to be satisfactory for such a testing technique.

Plans: Testing of additional fleeces at this level of processing should be done before final conclusions are drawn.

2. Freedom from Black Fiber in Hampshire Sheep is Moderately Heritable

Collection of data is being continued but no further analysis of results is available at this time.

3. Evaluation of Handling Properties of Wool

Further analysis of softness cores and their relationships to fineness of the wool scored has revealed a high positive correlation between these factors. Age of sheep as exhibited by mature Targhee rams apparently has no effect on this relationship.

Plans: Evaluation of these data is being continued and should be accomplished during the ensuing year.

4. Evaluation of New Traits for Wool Improvement

Collection of data on crimp and density is being continued, but no further analysis of results is available at this time.

5. Histological Report on Growth of Karakul Wool

This work is being continued and results will be available at a later date.

6. The Effect of Season on the Skin and Fiber Follicles

Procedures have been worked out for the periodic examination throughout the year of the skin and fiber follicles, as well as the blood supply of the follicles, of Merino and Hampshire sheep and Toggenburg goats. These animals were selected as examples of practically non-shedding and shedding animals. Simultaneously with the collection of skin and fiber samples from the live animals, techniques for the study of the blood of these animals are being employed to ascertain any possible changes in the blood itself which may be related to season and perhaps to fiber growth. In addition, tests are being conducted to determine whether or not physiological differences may be found in the fibers of the animals studied.

Plans: This work is being continued.

7. Development of Scourable Sheep-Branding Fluids

Testing of branding fluids for durability and scourability is being done in cooperation with the Idaho Experiment Station at Dubois and at other points in Idaho. There has been developed a workable sheep branding fluid designated as Formula G. This program includes not only the testing of branding fluids that are being developed in this country, but also those fluids that have been or are being developed in Britain and Australia. Preliminary results on the scourability of fluids used in 1954-1955 indicate that the fluids being developed under this program are superior to other domestic fluids tested in that period. For the 1955-1956 period seven different fluids are being tested at the various locations in Idaho. Results of this research program will be published as soon as they can be properly evaluated.

Plans: This work is being continued

8. Processing and Evaluation of Wool Fibers

Processing data of carding and combing main matchings of individual Targhee yearling fleeces was incorporated in a study to determine the heritability of processing traits and their relationships to other characteristics being studied in the breeding research program at Dubois. The object of this study was to determine whether processing qualities of wool could be improved by selection as indicated by heritability and the relationships to other traits of carding and combing yields of main sorts of individual Targhee fleeces. The results of this study indicate that selection for improvement of most



processing traits may be somewhat limited in its effectiveness; however, high clean yield and low noil yield could be improved by selection. It may be that further processing research such as that conducted under contract with the Lowell Technological Institute Research Foundation will be necessary in order to more precisely identify individual differences between fleeces and to fully determine the research value of carrying processing to the yarn stage. Laboratory analysis of the processing products, through top, for length and fineness has not yet been completed.

Plans: This processing work and laboratory analysis is being continued.

#### 9. Processing 1954 Dubois Clip

In a cooperative undertaking with the Idaho Agricultural Experiment Station, arrangements were made to process into top various lots of wool in order to determine (1) the minimum amount and kind of sorting required for satisfactory processing results, and (2) the relationship between sorted, partially sorted, and unsorted or graded lots of grease wool and the resultant top. Noble combing of these wools indicated that Dubois wools may not require any more sorting than the simplest method mentioned above. These wools seem sufficiently improved in uniformity of fineness that simple stain and tag removal and grading are adequate for average top manufacture. Using 60/62 staple wool as an example, the coefficients of variation for the three types of sorting are: sorted 25.49%; partially sorted 25.77%; and unsorted 26.27%. Since these wools were Noble combed, no direct comparison of the French combing of duplicate five-pound samples at Beltsville could be made with the top results obtained by the mill.

Plans: This work is being continued

### B. Production Economics Research Branch - ARS

#### 1. Production Costs and Returns on Sheep Ranches

Cooperative studies have been undertaken to determine the organization, production, labor, and other production requirements, investments, costs, and incomes on family-operated sheep ranches in sample areas in the west. One such study has been nearly completed this year for the non-migratory range areas of west Texas, southern New Mexico, and southeastern Arizona. Some work remains to be done on the report before publication as a cooperative bulletin by the New Mexico Agricultural Experiment Station. One significant fact revealed in this study is that, despite drought and other hazards, sheep ranchers have maintained or increased lamb and wool crops. Improved selection and management and a willingness to buy feed when needed kept production up and increased profits, or at least reduced losses.

Plans: This study, as well as similar studies in the Northern Great Plains and the Intermountain Region, will be reviewed periodically to provide a continuing appraisal of the economic position of family-operated sheep ranches.

2. Hired Labor on Sheep Ranches in Utah

A study, cooperative with Utah Agricultural Experiment Station, of labor problems on sheep ranches was completed this year and awaits publication by the Utah Station. The study reveals that, despite increases in wages and other perquisites in recent years, sheep ranches have a relatively high turnover in labor, especially near urban areas. Sheep ranchers have not competed very successfully for labor with other employers or with other industries. Wider use of Indians who are perhaps less well equipped for other jobs may relieve the sheep ranch labor problem.

3. Farm Flock of Sheep on Irrigated Farms in Montana

Final revisions of the report on this study have been made during the year and it is now being printed by the Montana Agricultural Experiment Station. The study shows that properly managed farm flocks of sheep can contribute materially to the income from irrigated farms without competing significantly with other enterprises for labor or other resources. Initial investment in fencing was a big item of cost. Farm flocks should return about \$10 per ewe for labor and management above all other costs.

PROPOSALS FOR COMMITTEE  
CONSIDERATION

1. Comprehensive and Coordinated Investigations on Production of Sheep and Utilization of Meat and Wool

Initiate a program of research to establish the complex relationships and interactions between genetic and environmental factors such as breeds of sheep, breeding systems, flock management practices, types of range, feeding regimens or levels of nutrition, climatic conditions, geographical locations and other production variables, and the quality, quantity and resulting economic value of the meat, wool skins, and byproducts.

The work would be initiated at various geographic locations on genetically stabilized groups of sheep. The effects of genetic, environmental and nutritional factors on important traits of lamb and wool production will be studied. Emphasis will be given to the



effects of excess or deficiency of ingested metallic salts upon (1) original color, (2) susceptibility to yellowing, (3) chemical reactivity to bleaches, carbonizing agents, dye stuffs, and other processing chemicals, and (4) mechanical properties of wool fibers.

2. Causes for and Measures of Relieving Periodic Variation in Fineness of Navajo Sheep Fleeces

Initiate research to determine what environmental factors are causing restricted fiber diameter and to find means of alleviating this situation. A tendency for Navajo and Navajo crossbred fleeces grown at Fort Wingate, New Mexico to become finer by several grades in between weaning time and shearing is a serious problem when selecting sheep for wool on the basis of weanling data.

3. Processing Tests on Wools to Demonstrate to Wool Growers the Undesirability of Weak Fleeces

Initiate processing research on small lots of sound and unsound wools to obtain specific information for demonstrational purposes on the bad effects of weak wool. While it is commonly advocated to woolgrowers that they should discriminate against tender or weak fleeces and to sack them separately from sound wool, the reasons for advocating such discrimination have not been demonstrated adequately.

4. Ranchers' Response to the Wool Price Program

Initiate economic studies to determine ranchers' response to the wool price program. Price incentives for wool may change significantly the competitive position of the sheep enterprise as compared to other enterprises on farms and ranches. Studies are needed to evaluate the place of sheep in the nation's agriculture under the new wool price program so as to provide information for sheep growers or prospective sheep growers as well as for administrators of the price program and policy groups.

## II. UTILIZATION

A. Western Utilization Research Branch - ARS

1. Modification of Wool to Retard Yellowing

Scoured domestic wools are widely reputed to have an off-white or yellow color not associated with many imported wools, and white wool fabrics tend to acquire an off-white or yellow color during use or storage.

(a) Yellowing Accelerated by Impurities in Grease Wool - The discoloration effects of wool grease, suint, and various chemical reagents are being studied under conditions of temperature and



humidity such as may be encountered in storage, upon extremely white fleeces. Wool grease and suint both impart non-scourable off-white colors to wool, with suint having greater tendency to cause this discoloration than grease. Urocanic acid, reported to occur in human perspiration, previously was demonstrated to be capable of accelerating the thermal yellowing of wool. Urocanic acid has now been identified as a constituent of suint (one part in five hundred of the suint solids) and appears to be one of the factors responsible for accelerated yellowing by suint.

Plans: Efforts will be made to isolate the urocanic acid from suint and to identify the other substances in suint that may be responsible for discoloration.

(b) Yellowing Promoted by Light - The protective action of butyl phosphate, reported as being unique among the alkyl phosphates, has now been demonstrated with several other alkyl phosphates. Recent studies suggest that the tributyl phosphate has an unusual affinity for wool. The mode of application appears to be a critical factor. Several other substances have been found to afford protection against yellowing by light. One of the most interesting of these is tetrabutyl titanate, which has recently become available in limited commercial quantities. Impregnation of wool with this substance affords better protection of the wool than the two-step treatment with acetic anhydride and tributyl phosphate previously described. The nature of the reaction of tetrabutyl titanate with the wool has been investigated and found to be a free radical mechanism.

Certain ultraviolet light absorbers, such as the active ingredient in sun-tan preparations which function by converting the incident light energy to heat instead of permitting it to effect chemical changes in the protein, have been reacted with wool. The subsequent yellowing of these treated wools has been studied. Actual chemical combination of the wool with the UV absorber was achieved in one case, giving some protection against yellowing. The protection, however, was less effective than that given by the other substances discussed in this report.

Plans: To extend these studies on free radical mechanisms, indicated above, in order to develop permanent protection against light yellowing without changing other desired fiber characteristics.

#### Publications:

Advancing Frontiers in Wool Chemistry. H. P. Lundgren, Proceedings, Inter. Wool Textile Res. Conf., Sidney, Australia, 1955.

## 2. Modification of Wool to Impart Shrink Resistance

(a) Treatment with Vinyl Polymers - The investigation of vinyl monomers polymerized in wool fabric to impart shrink resistance have developed



encouraging results. NN'methylene-bis-acrylamide when polymerized in wool flannel cloth gave the best shrinkage protection obtained among a number of vinyl compounds tested to date. Wool treated to contain 10% by weight of this agent was limited to a shrinkage of 5% under conditions producing 35-40% shrinkage of the untreated control cloth. Compared with polyacrylonitrile treatment reported last year, the NN'methylene-bis-acrylamide treatment represents an improvement in that a smaller quantity of polymer deposition will impart the same degree of shrinkage protection. Unfortunately, this advantage is gained at the expense of increased harshness. The degree of shrinkage protection is related to the hardness of the polymer formed in the cloth under polymerizing conditions employed: the harder the polymer, the better shrinkage protection obtained. For example, copolymerizing NN'methylene-bis-acrylamide with acrylamide in wool to obtain a softer resin will preserve the soft wool handle, but the shrinkage protection decreases.

Plans: Efforts are directed toward improving the shrink resistance with minimal quantities of polymer and at the same time retaining the natural handle of the wool. Pilot plant scale applications are planned for the most promising of these treatments.

(b) Modification with Epoxides - The stress-strain properties and shrinkage characteristics of wool treated with 3% butylene oxide were not changed significantly. However butadiene diepoxide, chemically related to the butylene oxide, at the same treatment level decreased the shrinkage of a wool flannel cloth by 30 percent. The diepoxide also protected the wool quite markedly against alkaline degradation. The reaction of butadiene diepoxide with wool has not been fully explained, but indirect evidence indicates that the sulfur bonds of the wool are involved.

Plans: Additional work with diepoxides is contemplated, including pilot plant applications.

(c) Modification with Azides - The studies on azide-treated wools showed that a marked degree of resistance to shrinkage in laundering is imparted to wool flannel treated with the azide of succinic acid. Moreover, the treated wool is whiter than the untreated. The characteristic water-shedding property of normal wool is not destroyed by the azide treatment, although most chemical treatments to improve shrink resistance impair the ability of the wool to shed water. Another characteristic imparted by the azide treatment is a strong resistance to supercontraction in lithium bromide solution. This indicates that the azide has reacted chemically by cross-linking units of the structure. Cross-linking is a desirable achievement, because it makes the wool much more stable to destructive environments.

Plans: Continue this work with the azides of other acids, and to make intensive laboratory studies and pilot plant applications of those that are most promising.



3. Modification of Wool to Protect Against Alkaline, Oxidizing, and Reducing Media

The sulfur links of wool are susceptible to cleavage by alkaline, oxidizing, and reducing media. Wool is therefore subject to damage when exposed to such conditions during processing or use. Replacement of the sulfur links by others more chemically stable is a reasonable way of restricting or preventing such damage.

(a) Bismaleimides - Consideration has been given to bis-maleimide reagents expected to react with sulfhydryl groups of reduced wool to produce new links known to be more chemically stable. Several such reagents have been synthesized for the first time. These appear to react readily with wool in the desired manner. The solubility of these treated wools in alkali is greatly reduced. Moreover, the wools are resistant to reducing agents encountered in stripping operations and their stability toward oxidizing agents used as bleaches is markedly improved.

(b) Polyamides - A variety of acrylamides has also been found to react similarly with the sulfur of reduced wool to produce new and stable linkages. These reagents have the advantage (for treatment of wool) of high water solubility and low volatility. Some of these compounds react very rapidly with wool to impart marked resistance to degradation by alkaline, oxidizing, and reducing media.

Plans: To investigate these and other reactions further, with the aim of developing processes, through pilot plant applications of laboratory-developed treatments, that may be industrially feasible.

Publications:

Dimaleimides as Cross-linking Agents for Reduced Wool. J. E. Moore and H. P. Lundgren. Proceedings, Inter. Wool Textile Res. Conf., Sidney, Australia, 1955.

Cross-linking in Bovine Serum Albumin and Wool Keratin. J. E. Moore and W. H. Ward, Abstracts J.A.C.S., September 1955.

4. Mode of Action of Whiteness Retention Agents

This work has been supported by funds supplied by the Office of the Quartermaster General. The research has not been completed, but has had to be suspended due to lack of continued financial support.

Publications:

Physical Chemical Studies Related to the Role of Whiteness-Retention Additives in Detergent Action. W. Fong and W. H. Ward, Textile Res. Jr., 24, 881 (1954).



5. Survey of High Energy Radiation Effects upon Wool

It was observed that wools subjected to soft x-rays and gamma rays underwent degradation as indicated by their mechanical behavior. This degradation appeared to result from the effect of the radiation treatment upon the sulfur links.

Plans: To establish the cause of the degradation and to determine whether modifying the sulfur links by such treatments as with bis-maleimide will afford protection against radiation damage.

6. Studies and Processing Trials on American Grown Wools

This investigation has been a thorough study to determine effects of ageing and steaming of wool before spinning, in order to lay the basis for improved efficiency in spinning worsted yarns. This investigation was done under contract with the Textile Research Institute, Princeton, New Jersey, and was completed in April 1955.

This investigation has established that accelerated ageing by steaming of wool prior to spinning improves the spinning efficiency of worsted yarn processed in the Bradford as well as the French system. Optimum conditions for steaming have been established. Although the observed effects of accelerated ageing are not great on the French system, they are very marked on the Bradford system. The major difference in the French and Bradford processes is that relatively high twist is applied to the fiber assemblies before Bradford spinning. This investigation indicates that the benefit derived from steaming is due mainly to stabilization of this twist. This stabilized twist reduces breakage during spinning.

Spinning efficiency is measured by the frequency of yarn breaks, which require manual labor for repair. Consequently any reduction in the average number of breaks increases the economy of operation. Moreover, better spinning performance means that steps following spinning can be carried out more efficiently and that the final product is likely to be of better quality.

Application of these findings can be made with very little modification of current processing methods and should afford tangible economies in processing costs.

Plans: No further work is planned because the objective of this study has been achieved. The specific details of this work will be published in technical journals.

7. Structure and Stability of Wool

Changes in microscopic structure and chemical composition occurring during acid degradation of wool have been observed. The material



most quickly removed from the fiber on treatment with cold strong hydrochloric acid is relatively low in sulfur, emphasizing the importance of sulfur links in maintaining fiber structure. On continued treatment, the residue breaks up into spindle-shaped cortical cells, which represent the largest single microscopic component of the fiber. These cells have been isolated and analyzed. Those resulting from acid treatment differ in chemical composition from cells resulting from enzyme digestion. Spindle-cell preparations of wools and mohair have been separated into two distinct classes of cells which differ appreciably in density and sulfur content. These observations are important because of their probable relation to uneven dyeing and to the non-uniformity of fiber structure associated with crimp. These possibilities are being investigated.

Plans: Products from the acid treatment of wool will be separated and characterized by chemical and physical properties. Appropriate comparison will be made with other degradation processes, such as alkaline degradation. The resulting information will be interpreted with reference to the original fiber structure and with regard to practical applications in processing procedures.

Publications:

Amino Acid Composition of Normal Wools, Wool Fractions, Mohair, Feathers, and Feather Fractions. W. H. Ward, C. H. Binkley, and N. S. Snell, Textile Res. J. 25: 314, 1955

8. Comparison of Mechanical Properties of Natural and Modified Wools

(a) "Tender Wools" - Mechanical and physical properties of an excessively "tender" wool, weak and subject to excessive fiber breakage during processing, have been evaluated. This wool is markedly irregular in diameter along the fiber length. Sections of either fine or coarse portions have normal mechanical properties. Fibers with both fine and coarse sections give a typical stress-strain relationships which can be accounted for as the summation of stress-strain components of the individual sections. Tenderness apparently results from concentration of stress in the finer cross-sections.

Plans: Other wools having different processing behavior, ranging from defective to preferred, will be analyzed in order to establish objective bases for wool quality factors.

(b) Mechanical Degradation of Wool Produced by Light - Tensile strength and elastic recovery of wool are diminished by exposure to ultraviolet light. These mechanical changes occur rapidly and may be detected before yellowing is apparent. Preliminary results indicate that these changes are correlated with cleavage of the sulfur links by light.



Plans: Wools in which the sulfur bonds have been chemically modified to resist degradation will be tested for stability of mechanical properties after ultraviolet irradiation. This research will provide further evidence for the mechanism and conditions of degradation and point the way to possible commercially practicable treatments.

(c) Frictional Properties of Wool Fabrics - An instrument has been built which analyzes the sound made when fabrics are rubbed. By this means several fiber and fabric properties that affect "handle" have been shown also to affect the sound generated. Several stages in processing are known to harshen wool, so that it is customary to apply finishing procedures and agents to give a final desirable handle, important in maintaining the competitive value of wool fabrics. Handle is now judged subjectively by feel. It is important to supplement or replace this subjective test by physical measurements to reduce the importance of individual experience.

Plans: To redesign the equipment to cover a wider frequency range and increase its sensitivity. In addition, efforts will be made to adapt it for testing yarn and bulk wool.

9. Investigations of Specific Dyes and Other Stains to Reveal Differences in Wool Structures

Solutions of lead plumbite preferentially stain the paracortex of wool as observed in microscopic sections of single fibers. By this technique, relative amounts and distribution of paracortex were observed in a group of comparable wools of known history. The proportion of paracortex to orthocortex as found to increase with fiber diameter. This explains why finer wools are more reactive in general with chemical agents, since they contain more of the highly reactive orthocortex component. These results also correlate with stress-relaxation measurements.

The finer fibers, which are more highly crimped, are characterized by unsymmetrical location of the paracortex in the cross sections; in contrast, the paracortex of the straighter fibers has a more symmetrical distribution. The unsymmetrical location of the paracortex is in accord with the higher crimp of the finer fibers.

The paracortex areas in many Rambouillet, Columbia, and Navajo wool fibers showed a "twinned" structure.

Plumbite staining is increased somewhat by stretching the fibers and very greatly by supercontraction. This is a useful guide for comparisons of wool structure.

Lincoln wool appears to contain only paracortex, staining over the whole cross section. On the other hand, mohair, reported by others to contain only orthocortex, also stains over the whole cross-section and thus indicates that it contains substantial amounts of paracortex.



Plans: To apply this lead plumbite technique in further comparisons of wool structure and modifications produced by chemicals, light, heat, etc.

10. Stress Relaxation Analyses and the Stability of Sulfur in Wool

Previously developed interpretation of stress-relaxation measurements of single wool fibers indicates the relative amounts and stability of two classes of wool sulfur bonds in wool structure. Current studies support earlier indications that these two classes of bonds may be identified with the orth- and para-cortical components.

The relatively slow breakdown of the sulfur links in wool by hot water is greatly accelerated by traces of silver, a trace metal which has been found in certain Montana wools. On the other hand, one means of protecting these sulfur links against breakdown by silver is achieved by chemical treatment with bismaleimides.

A research contract is now being negotiated to make further studies of metallic constituents in wools and their effects upon the physical and chemical characteristics of the fibers.

Plans: To extend stress-relaxation studies to show further details of wool structure and to evaluate methods for improving the stability of wool.

11. Dielectric Constant of Wool at Microwave Frequencies

Dielectric constant and dielectric loss factor measurements on wool have been extended to the high frequency and of the super high frequency (SHF) band where, for the first time, dielectric measurements on single wool fibers have proved feasible. This has made possible dielectric measurements on wool over the whole range of absorbed water. Previously, measurements could not be made on wool with a water content greater than one-half the saturation value. These measurements confirm the original interpretation of the wool-water interaction. Measurements at the higher moisture content provide a more detailed description of the absorbed water. Analysis of these experiments supports currently acceptable concepts of the basic processes concerned in absorption of water by wool. This new and important single fiber technique provides a rapid, non-destructive method for studying variations in fiber properties along the length of the fiber.

Plans: No further study of the dielectric constant of wool at microwave frequencies is planned.

Publications:

Dielectric Properties of Wool-water Systems at 300 and 9300 Megacycles. J. J. Windle, T. M. Shaw, J. Chem. Phys. 22, 1752 (1954)



Publications (continued)

Microwave Dielectric Measurements on Single Fibers. J. J. Windle, T. M. Shaw, Phys. Rev. 98, 281 (1955).

12. Magnetic Absorption Studies of Wool Structure

Studies indicate that practical routine measurement of the moisture content of wool fiber by nuclear magnetic resonance appears feasible. These studies have also indicated that the width of the proton resonance line observed for wool fibers can be related to the energy with which water is held on wool and consequently the nuclear resonance technique offers the possibility of studying the binding energies of water sorbed onto wool.

In order to obtain as much information as possible from the nuclear resonance data on wool, a detailed study has been made of glycine, the simplest amine acid in wool. For this simple case it has been possible to compare the observed nuclear resonance line shape with one calculated for glycine. Good agreement was obtained at both 195°C. where the hydrogen atoms have essentially fixed positions, and at room temperature where they oscillate with a frequency sufficient to cause a marked decrease in line width. This study of glycine has enabled a more detailed interpretation of the proton resonance data on wool fibers to be made. In particular the glycine data has made it possible to separate out the effects due to the hydrogen atoms in the wool from those associated with water.

This project has been terminated.

Publications:

The Position of Hydrogens in Glycine by Nuclear Magnetic Resonance. K. J. Palmer, T. M. Shaw, R. H. Elskens, and F. G. Creese. Program and Abstracts of American Crystallographic Association Summer Meeting (1955).

13. Treatment of Wool Scouring Wastes

Investigation of colloidal bentonite as an inexpensive supplementary coagulant in the conventional acid-cracking process for treating wool scouring wastes has been extended. The amount of bentonite required for effective clarification has been shown to depend on the suint content as well as the grease content of the scouring wastes. Considerably less bentonite and acid are required in the treatment of waste liquor obtained from the scouring of desuinted wool than are required for the treatment of waste liquor obtained from scouring the original raw wool. In the treatment of waste liquors containing only suint, the combination of bentonite and acid reduced the chemical oxygen demand to a considerably greater extent than acid treatment alone, showing that under acid conditions



bentonite effectively removed suint from solution.

Comparison of a number of commercially available, water-dispersible colloidal clays as supplementary coagulants showed that attapulgite, magnesium silicate, and calcium bentonite were nearly as effective as the widely used Wyoming type bentonite adopted as a comparison standard in this investigation. Non-dispersible clays such as fuller's earth and Kaolinite were relatively ineffective as aids to coagulation. The effectiveness of bentonite as compared to equal weights of several common chemical coagulants has been determined. Alum was relatively ineffective as a supplementary coagulant in acid cracking; similarly, in the cases of ferric sulfate and calcium chloride, approximately two to three times the concentration was required to give the same degree of clarification as with bentonite.

A preliminary pilot-scale evaluation of the bentonite-acid treating procedure has been carried out in cooperation with the Abbot Worsted Company, Forge Village, Mass., which uses the calcium hypochlorite process for treating wool scouring wastes. In treatment of scouring waste at this plant, 0.1% bentonite at a pH of 3.5 was sufficient to produce a clear effluent. The rate of sedimentation of the sludge was somewhat faster than by the calcium hypochlorite process.

Difficulty was encountered in an attempt to recover the grease from the bentonite-acid precipitated sludge by plate-and frame filter pressing. The sludge was difficult to de-water. After pressing, the residual cake had a grease content of 29% as compared to a residual grease content of 20% in the calcium hypochlorite process, indicating that filter pressing is not an acceptable method of grease recovery under these conditions.

The scouring of raw wool under neutral conditions, with nonionic detergents replacing the traditional alkaline treatment with soap and soda ash, has gained considerable acceptance in recent years. Scouring waste emulsions stabilized by nonionic detergents are not easily broken by conventional acid-cracking. Treatment of waste samples from nonionic scouring by the bentonite-acid method has shown that successful clarification can be accomplished. However, sedimentation of the precipitate sludge was quite slow and required preliminary heating.

Plans: To continue the study on treatments of wastes from scouring by nonionic detergents.

Publications:

Treatment of Wool Scouring Waste with Colloidal Bentonite. W. Fong and H. P. Lundgren. Proceedings International Wool Textile Research Conf. Geelong, Australia, (1955).



#### 14. Pilot-Scale Evaluation of Alcohol-Suint Scouring Process

Several years ago it was shown that the scouring properties of natural suint in grease wool could be enhanced by addition of controlled amounts of n-butyl alcohol and common salt. A pilot-scale evaluation of this alcohol-suint scouring process has recently been completed by the Lowell Technological Institute Research Foundation, under sponsorship of the Committee of Wool Scourers, a voluntary organization of New England wool scouring establishments concerned with the problem of scouring-waste disposal. These studies confirmed the ability of the alcohol-suint process to scour wool to an acceptable residual grease level of about 0.5% at a feed rate equal to that of the conventional soap-soda process.

Plans: No further work is planned.

#### B. Eastern Utilization Research Branch - ARS

##### 1. Wool Grease

A method has been developed whereby wool grease can be effectively reduced chemically with sodium to form useful products (alcohols). The process can be applied to all grades of grease. Even acid cracked grease can be used as a raw material with only minor preliminary treatment. The yield of alcohols produced, depending upon the grade of grease reduced, varied from 65-80%. This is about twice the yield obtained by splitting with alkali. When wool grease is reduced with sodium the hydroxy acids are converted to wool grease glycols.

Since wool wax alcohols, naormally obtained by the alkali splitting of wool grease, are used as emulsifiers, and since it has been reported that the glycols obtained by reducing the alpha-hydroxy acids are powerful emulsifiers, it was expected that the reduction product (wool wax alcohols plus glycols from the hydroxy acids) would be good emulsifier. This proved to be the case, i.e., reduced lanolin was as good an emulsifier as wool wax alcohols. This finding may lead to wider use of wool grease in specialty emulsifiers.

In this investigation stubborn emulsions encountered in the recovery of the product alcohols caused difficulty. This difficulty, due to the presence of soluble sodium soaps, was eliminated by converting them to insoluble barium soaps. This technique can be used to advantage in combating emulsion problems encountered in the reduction of other waxes. A paper describing the sodium reduction of wool wax and the recovery of the products has been prepared for publication. A patent application, covering some of the details of the method, has been filed.

Investigatinnns on the isolation and characterization of individual wool grease compounds are continuing. A fraction of wool wax alcohols was obtained by precipitation as urea complexes. This



fraction was acetylated and distilled through a spinning band column. Sixty-nine fractions were collected, representing 45.9% of the charge. The first 53 fractions, accounting for 25% of the charge, are liquids at room temperature; the remaining fractions are solids or in the case of a few transition fractions, a mixture of solid and liquid. The distillation data suggest that separation into two pure materials has been achieved. The fractionations are being continued.

The feasibility of using the formation of borax complexes as a method of obtaining hydroxy acids from the wool wax acid fraction was studied. A mixture of hydroxy and non-hydroxy acids containing 33% of the former was treated with an aqueous borax solution and the mixture extracted with a petroleum solvent. The hydroxy acids were concentrated preferentially in the borax layer. The acids recovered from the other layer contained only 16.9% hydroxy acids. This approach appears to have considerable promise.

#### C. Home Economics Research Branch - ARS

##### 1. Serviceability of Wool Fabrics

The potential usefulness of medium and coarse wool in clothing is being investigated by a serviceability study of experimental whipcord suitings (two all-wool composed of fine and medium fibers and four containing different amounts of medium and coarse wool, staple rayon, and staple nylon). Trousers made from these fabrics were put in service during the fall of 1952. Samples were withdrawn at specified intervals to determine the fabric deterioration due to wear and cleaning. Five of the 52 trousers remaining in service were worn out after 40 weeks of wear and 40 dry-cleanings. The remaining fabrics will be retained in service until the trousers are no longer acceptable for wear.

In developing criteria for evaluating the chemical deterioration of the fabrics during wear, samples of wool-nylon fabrics were analyzed for percentage fiber composition by four different methods. Results indicate that the sodium hydroxide method is simpler and more accurate than either the formic acid, hydrochloric acid, or sodium hypochlorite methods and requires half the time of the other methods. An article incorporating these findings is in preparation.

##### 2. Care of Clothing and Household Fabrics

Household and institutional use of quaternary nitrogen and other compounds to impart antibacterial properties to fabrics is becoming widespread. Factors which affect the evaluation of these disinfectants on fabrics are being investigated. After treatments with a quaternary germicide to impart antibacterial properties, the amounts which desorbed from wool fabric have been determined

chemically and biologically. When treated with various concentrations of the agent, wool retains a large proportion of the germicide, probably due to the chemical reaction between the wool and the disinfectant. Sufficient quaternary does desorb from wool, however, to inhibit the growth of certain bacteria, the efficacy of the germicide depending on the susceptibility of the specific test organism. Three of the organisms used were found suitable for the evaluation of germicides as bacteriostatic agents for fabrics. Procedures resulting from this research are contributing to the work of the Antimicrobial Committee of the American Association of Textile Chemists and Colorists, in developing standard methods for testing the value of treatments to sanitize and render fabrics bacteriostatic.

The sanitizing values of 4-chloro-3,5-Xylenol, a detergent containing this germicide, and a detergent alone, were determined. Treatment with these agents reduced the numbers of several genera of microorganisms inoculated on wool fabric but did not render the material free from live organisms. Two concentrations of the same three reagent interfered with but did not completely inhibit the respiration of these same microorganisms.

Plans: Research will relate to germicidal fluorides, varying the temperature, time, test organisms, and fluoride neutralizers.

Publications:

Characteristics of a Proteolytic Enzyme. Margaret Towell Goldsmith. Presented at meeting of the Washington Branch of the Society of American Bacteriologists, February 1955.

Bacteriostatic Properties of Fabrics Treated with Quaternary Germicide under Varied Weight-Volume-Concentration Ratios. M. T. Goldsmith, M. A. Latlief, J. L. Friedl, and L. S. Stuart. Presented at the national meeting of the Society of American Bacteriologists May 1955.

Desorption of Quaternary Nitrogen Compounds from Cotton and Wool Fabrics. M. T. Goldsmith and M. A. Latlief. Applied Microbiology 3 (4): 195-197, July 1955.



PROPOSALS FOR COMMITTEE  
CONSIDERATION

1. Comprehensive and Coordinated Investigations on Production of Sheep and Utilization of Meat and Wool

(See No. 1 under PRODUCTION)

2. Stabilizing Wool Against Thermal Degradation

Expand the present studies of the degradation of wool caused by heat, such as experienced during storage, handling and use, so that early determination of factors can be accomplished. This basic information is essential to the anticipated pilot-plant studies to establish the commercial feasibility of new treatments to stabilize wool against thermal deterioration.

3. Counteracting Wet Wool Odor

Initiate a comprehensive study of the factors responsible for the characteristic odor of finished wool items when wetted, starting with the isolation and identification of the related chemical constituents, as the basis for development of treatments to overcome this difficulty. Pilot-plant application of promising treatments should be made to help guide the basic studies and to expedite commercial usage of successful processes.

4. Basic Study of Wool Surface Properties

Expand research on the surface properties of wool, with particular emphasis on determining the basis of handle of wool fibers and wool-containing fabrics. The surface properties of wools of known histories, with and without various chemical modifications and finishing treatments, should be comparatively evaluated by study of pertinent single fiber characteristics such as bending and torsional moduli and analysis of vibrations frictionally produced when fibers or fabrics are rubbed. These characteristics should be correlated with spinnability, felting, and other processing and use characteristics. In order that these studies can yield tangible benefits to the wool industry as soon as practicable, extensive use of pilot-plant scale facilities will be required for processing the many lots of variously-treated wools under carefully controlled conditions in equipment similar to that used in commercial practices.

5. Improved Procedures for Servicing Wool-Containing Items

Expand and where necessary initiate laboratory research and pilot plant studies to develop improved procedures and products for maintaining and servicing wool-containing fabrics in order to best retain their original appearance and properties. This type of information is needed to lengthen the life expectancy of fabrics and to

maintain such desired characteristics as resistance to soilage and insect damage, good handle, thermal insulation, moisture absorption control, and freedom from odor and dustiness.

Work will be undertaken in the following areas: (a) development of cleaning method which will embody the best principles of wet and dry cleaning, and of treatments which maintain the desirable characteristics of wool under the deteriorative action of use and cleaning or of restorative treatments that can be applied periodically; (b) development of effective procedures for home cleaning that will retain the desirable characteristics of fabrics and of home ironing and pressing techniques that will give a finished and tailored appearance; and (c) development of methods of applying moth-proofing treatments as a part of commercial drycleaning and laundering.

6. Reactive Sites and Chemical Behavior of Wool Fibers

Expand research to locate and thoroughly characterize the reactive sites in wool fibers in order to facilitate discovery and development of chemical and other treatments that will give enhanced properties to wool such as resistance to shrinkage, moisture, and insect damage. These studies should take full advantage of the use of chemical agents that stain or tag specific areas of the wool structure as revealed by microscopic, X-ray, spectroscopic, and other analytical methods.

7. Improved Methods for Bleaching Wool

Initiate research to develop new or improved products and procedures for bleaching wool, with the investigations particularly directed toward making possible the greater utilization of wools of widely varying initial color and condition in white and pastel-colored end-items. These studies should also seek ways to minimize damage to wool during bleaching operations and to lower the processing costs. Pilot-plant studies should be made to evaluate the fundamental laboratory research in terms of bleaching effectiveness and the effects of such treatments upon subsequent processes to produce durable pastel shades, resistance to shrinkage and insect damage, and other special characteristics, and upon the efficiency of mill operations such as combing, carding, and spinning.

8. Improved Methods for the Home Construction of Wool Garments and Household Articles

Initiate research to determine the most effective home sewing procedures for constructing and pressing wool garments which will give satisfaction in use and cleaning. Emphasis will be placed on such factors as kind and direction of seams and edge finishes, and type and quality of thread in relation to machine adjustment, tailoring processes, and fabric qualities.



9. Physiological Requirements of Clothing

Initiate research to determine the effect of fabric quality, clothing construction, and design on comfort. The relative insulating values of different fabrics and the effect of fabric and garment construction on absorption of perspiration and retention of body heat will be emphasized.

III. MARKETING

A. Agricultural Economics Division - AMS

1. Current Outlook and Situation Analysis for Wool

This work appraises the current and prospective economic position of wool and related fibers to aid farmers in their management decisions.

Analyses of the factors affecting supplies, prices, utilization of wool and related fibers are directed toward meeting requests for information relating to these commodities. The appraisals of the economic position of the commodities are revised regularly to reflect changing conditions and new developments. The results of the analyses are made available to the public through the Situation and other reports. The results of a special analysis of post-war trends in mill use of apparel wool and the factors associated with these trends were published in the April 1955 issue of The Wool Situation.

A handbook of long-time statistical series and other data indicating basic trends affecting production, stocks, trade, consumption, and prices of wool, mohair, and related and competitive fibers was prepared and published. A supplement designed to bring the statistical series in that publication up to date is now in process of preparation. It is planned to issue such a supplement each year.

Publications:

Mill Use of Apparel Wool in the United States Since World War II. Albert M. Hermie, The Wool Situation, TWS-31, 28-37 (April 1955).

Wool Statistics and Related Data. Statistical Bulletin No. 142 (1954).

The Wool Situation (4 issues a year).

2. Analyses of Demand for Wool and Other Fibers

Statistical analyses of the factors that cause variations in mill consumption of wool in the United States are under way. The objective is to identify the major economic forces involved, measure their effect, and indicate any shifts in their relative importance. Study is also being made of important trends in consumption and their causes. Competitive relationships between wool and other



fibers are to be investigated and, where possible, the degree of competition measured. Areas in which additional or improved data would be of value to the industry or for research purposes will be delineated. This is part of a larger study of the demand for textile fibers in the United States.

In connection with the foregoing, analyses of the factors that affect consumer expenditures for apparel are in process. This work is an extension of a study of the prewar experience. Preliminary findings indicate a marked decline in the income elasticity of expenditure for apparel since the 1930's to about zero in the postwar period.

## B. Biological Sciences Branch - AMS

### 1. Protection of Wool from Insect Damage

These studies are directed towards the development of methods to prevent insect injury on wool and woolen products in trade channels or in the possession of the consumer, and techniques of application for use by the warehouseman, the manufacturers, launderers and dry cleaners, or the householder. Special studies to improve methods of protection used by the Military are carried on in conjunction with the above.

It was found that DDT residues in woolen garments levelled off at approximately 1% by weight of the cloth, when the garments were given repeated treatments with EQ-53 at the recommended rate of 1/2 ounce per pound of dry wool. If the garments were repeatedly washed and then retreated with EQ-53 in the rinse water, the level stayed approximately as in the initial treatment. The DDT residues in woolens immersed in an oil solution of DDT was found to be proportional to the amount of solution picked up by the woolens, and not selective as when they are immersed in nonionic emulsions such as EQ-53.

Strobane and Perthane, two new insecticides, were found to protect woolens equally as well as DDT in the standard 28-day CSMA test with black carpet beetle larvae, at levels of deposit about 5 times that needed with DDT. Perthane residues lasted 4 years without deterioration (longevity tests with Strobane are not completed). Strobane treatments resisted removal by washing or dry-cleaning in about the same degree as DDT treatments; Perthane treatments were removed to a greater degree. The contact residual toxicity to black carpet beetle larvae was about the same for both materials as with DDT.

Lindane crystals added to boxed woolen Army uniforms at the rate of 5 grams per cubic foot, have protected the uniforms from insect damage for  $2\frac{1}{2}$  years without replenishment. Naphthalene flakes added at the rate of 46 grams per cubic foot were all volatilized at the end of 6 months and severe damage was evident after 2 years. In a

laboratory evaluation for the Military, of a modified fluoride mothproofing compound which carried claims of retaining full mothproofing properties after 5 washings or drycleanings, it was demonstrated that the degree of effectiveness was considerably reduced by repeated washings, and mildly reduced by repeated drycleanings.

A one-year contract study was begun in July by the Lowell Technological Institute Research Foundation, Lowell, Mass., on the persistence of DDT deposits applied to grease wool through subsequent processing stages. In this study, lots of grease wool will be immersed in EQ-53 during the last rinse, and samples analyzed after each of the 12 processing stages until conventional knitting yarn is produced, to determine the level of DDT deposit remaining. A part of each sample will be tested for protection against insect damage.

Plans: Observations will be continued on long-term storage tests, some of which are now in their 8th year. New studies are planned to develop methods of applying mothproofing treatments as a part of commercial drycleaning and laundering procedures.

Publications:

Mothproofing Woolens. H. Laudani, Soap and Sanit. Chem. XXXL(8): 149, 151, 153, 177, 179, 181, August 1955.

C. Livestock Division - AMS

1. Specifications for Grades of Raw Wool

This work is designed to furnish basic information for fineness and length specifications for grade standards. It also involves the appraisal of objective methods of sampling and testing lots of wool and defining the various quality and utility characteristics for use in evaluating clips of wool.

(a) Fineness Specifications - Work has been carried out by sampling and testing 173 lots of wool differing widely in fineness for the purpose of determining the relationship of fineness to card sliver (raw wool), top, noil and percent noilage. Results obtained showed fineness of top, card sliver, noil and percent noilage to be highly correlated. The fineness of the card sliver was more directly related to the fineness of top than either the fineness of the noil or the percent noilage. It appears from these data that the fineness of raw wool is the most satisfactory single measure for estimating the fineness of top.

The basic information of this study was used in the proposal which was made March 29, 1955, to revise the official standards of the United States for grades of wool. These proposed changes would provide specifications in terms of microns for the 12 grades, 80s to 36s, inclusive, and also provide for the addition of two new



grades, 62s and 54s, with specifications in terms of microns for diameter and dispersion provided for each grade.

Preliminary analyses of the fineness data obtained from testing 46 lots of Commodity Credit Corporation owned wool in 1954-1955 has shown: (a) 48 percent of the lots produced a comparable grade of top to that of CCC appraisal of the raw wool, 46 percent of the total lots produced a top which was coarser in grade and 6 percent of the lots produced top which was finer than the classification placed thereon for price support purposes; (b) 93.5 percent of the lots of top produced from the graded wool met both the diameter and fiber distribution requirements of the official USDA standards for grades of wool top. Only 6.5 percent of the lots failed to meet the distribution requirements. Analyses of these data will be completed and a full report issued in the next few months.

Plans: Work along these lines will be extended in the next year to include the effect of preparation, skirting, and processing on grade of raw wool.

(b) Length Specifications - Current work is aimed at developing (1) length specifications for grease wools; (2) a suitable means of objectively sampling bags of grease wool by drawing grease wool staples, to estimate grease wool staple length and to compare with the fiber length of the resultant top, and (3) method of measuring the staples.

Analyses of the length data of the 46 lots of CCC wools indicate that the normal (unstretched) staple length of grease wool is a better indicator of the average length of the wool top than is the stretched staple length. Good repeatability was obtained using the wool staple sampling tool developed by the laboratory for drawing staples. Analysis of the staple length data for within- and between-bag staple length variance has been completed on 22 of these lots and will be used in developing sampling schedules for the determination of the number of staples to be drawn per bag and the number of bags to be sampled for lots of different grades of various sizes.

A machine for measuring the length of single fibers has been acquired and data will be obtained, by measuring the length of single fibers, to determine the changes which take place in fiber length as it is processed from raw wool into wool top. This new information will be directed toward the development of length specifications for grease wools.

Publications:

Core-Sampling Grease Wool for Fineness and Variability. D. D. Johnston, W. J. Manning, H. D. Ray, W. A. Meuller, and E. M. Pohle. U.S.D.A. (mimeographed), October 1954.



Publications (continued)

Proposed Changes in the Official Standards of the United States for Grades of Wool. Federal Register (7CFR Part 31), March 29, 1955.

Fineness Relationship of Raw Wool, Top, Noil and Percent Noilage. E. M. Pohle, D. D. Johnston, H. D. Ray, W. A. Mueller, H. C. Reals, and W. J. Manning. A paper given at the International Wool Textile Research Conference, Australia, 1955, and will appear in the Proceedings of the Conference.

2. Application of Quantitative Grade Requirements to Types and Classes of Imported Wools

This is a study of the relationship and feasibility of applying quantitative requirements to types and classes of imported wools to facilitate market price reporting and price relationship service, and to establish a more precise basis for collection of custom duties.

Approximately 130 samples of scoured core residues, representing various grades, types, and classes of wools from Argentina, Australia, Chile, New Zealand, and Uruguay have been tested for fineness and variability. Results of this study to date indicate that it is feasible to apply quantitative requirements to certain types and classes of imported wools; however, many more types and classes should be tested before final evaluations and conclusions are made.

Plans: In view of various application factors connected with the proposed specifications for grades of raw wool, future work will emphasize studies of imported carpet types.

3. Development of Wool Top Standard Specifications and Methods of Test

Revision of the standards for grades of wool top promulgated by the Secretary became effective January 1, 1955. The new standards include quantitative requirements for all grades, 80s to 36s, inclusive, with the addition of a new grade designated as 54s, making 14 grades in all. The revision seems to be well accepted by industry.

A revision of the official "Method of Test for Grade of Wool Top" was prescribed by the administrator of the Agricultural Marketing Service for determining conformity of wool top with the official standards and made available January 1, 1955.

Plans: Future work on this subject is not planned.

Publications:

Methods of Test for Grade of Wool Top. USDA (mimeographed), December 1954.

4. Objective Sampling and Testing Grease Wool for Clean Fiber Content

Work is continuing toward simplification and improving the accuracy of the objective core-boring method of determining clean yield (shrinkage) adopted by the Department several years ago. Problems under investigation include: (a) the method of taking a sample of grease wool; (b) adequacy of coring patterns; (c) methods and techniques for sub-sampling and testing the samples in the laboratory; (d) relationship of core yields to mill scoured yield, card sliver (ball) yield and top-noil-waste yield.

Testing is nearing completion on the 46 lots of CCC wools. Preliminary analysis of the testing results completed to date indicate: (a) accurate estimates of clean yields of grease wool can be made by the use of core samples; (b) the  $1\frac{1}{4}$ -inch cores gave more satisfactory results under the conditions of this study than either the 3-inch or the 3/8-inch pressure cores; (c) it makes little, if any, difference whether core samples are taken from the sides or ends of the bags; and (d) pressure core sampling (3/8" core) is practical and has several advantages over the electrically powered rotary method.

Plans: To complete testing and analysis of the 46 lots of CCC wools and direct future work to include the development of a new machine for sub-sampling core samples of wool in the laboratory, testing methods and techniques.

Publications:

Pressure Core Sampling of Grease Wool for Clean Fiber Determination. George C. LeCompte and Henry R. Keller. USDA (mimeographed), June 1955.

5. Development of Mohair Standard Specifications

Work relating to grade specifications for mohair tops has been carried on with the industry, primarily through the A.S.T.M. Tentative specifications and method of test for fineness of mohair tops have been approved by the sponsoring committee and accepted by the A.S.T.M. The minimum and maximum average diameter of fiber of 8 grades have been prescribed. It is proposed that these specifications be given time for trial before the Department takes steps to promulgate same.

Plans: Concentrated work on these grades and standards will be undertaken in the future, with an approach to the problem similar to that for wool and wool top.



D. Market Development Branch - AMS

1. The Economics of Recovery and Utilization of Wool Grease in the United States

The purpose of this research was to make an economic appraisal of the scouring, recovery, refining, distribution, and industrial utilization of wool grease. This work was done under contract with the Lowell Technological Institute Research Foundation of Lowell, Massachusetts. A final report has been published.

The study, among other things, indicates that an increase in the annual level of production of wool grease from around 10 or 12 million pounds to a minimum of 20 million pounds would help to stabilize supply and price in the industry. While an increased supply of wool grease will not solve all of the industry's problems nor completely eliminate fluctuations in supply and price, the same fluctuations allowing a higher mean annual production would have substantially less serious effects. The report also indicates that wool grease producers could profitably increase their production and contribute to greater dependability of supply by (1) investing in additional grease-recovery equipment, (2) adapting longer run pricing policies with a view to building markets, and (3) cooperating with refiners in a research program to find improved recovery methods.

Plans: This project has been completed and no further work is contemplated.

Publications:

Wool Grease: The Economics of Recovery and Utilization in the United States. Rober S. Raymond and Stuart L. Mandell, USDA Marketing Research Report No. 89, June 1955.

2. Lamb and Mutton Distribution and Availability Studies

The National Wool Act of 1954 provides for payments to producers as an incentive to increase production of wool. Since over two-thirds of the value of sheep and wool products is accounted for by lamb and mutton sales, the American Sheep Producers Council, composed of sheep producer organizations, has decided that the initial phases of the program will especially stress the promotion of lamb and mutton. Research has been initiated in cooperation with the American Sheep Producers Council for the purpose of providing basic information needed to develop an efficient program of merchandising and advertising lamb and mutton. Three studies are now under way to provide this information.

(a) Wholesale Distribution of Lamb and Mutton - This study is to find out where meat packers distribute the lamb and mutton which they produce. In cooperation with the American Meat Institute, Western States Meat Packers Association, Inc., and the National



Independent Meat Packers Association, packers slaughtering sheep and lambs in the U. S. have been surveyed and data obtained on States of destination of their lamb and mutton shipments. These data will provide good indications of the variations in lamb and mutton consumption by regions. Information on distribution practices will enable the industry to orient their distribution, sales, and promotional activities more efficiently. The data are now in the process of being tabulated and analyzed. Publication of the research results is expected before the end of the current fiscal year.

(b) Retail Availability of Lamb and Mutton - This study is to ascertain the availability of various cuts of lamb and mutton in different areas of the country to determine whether availability is a limiting factor in purchases of this kind of meat in certain areas. The field work of surveying retail food outlets is being carried out by the Bureau of the Census. A satisfactory pretest of this survey in 236 retail food stores across the country has been completed. It is anticipated that the full survey of 6,000 retail food stores throughout the United States will be conducted in October. A thorough knowledge of present practices will most likely be effective in improving sales of various cuts of lamb and mutton. Once the data have been collected, they will be analyzed and a report published.

(c) Consumer Use of and Preferences for Selected Cuts of Lamb - This survey was to evaluate consumer preferences for and attitudes toward fresh lamb in a selected marketing area wherein per capita consumption was believed to be relatively low. There has been little information of a qualitative nature available about the factors which influence the home consumption of lamb. A knowledge of the patterns of use and the opinions and attitudes concerning the consumption of lamb will indicate areas where additional promotion will most likely be effective in improving sales of lamb and mutton, and will enable the industry to orient their advertising and sales promotion activities more efficiently.

A published report of this research will be issued early in 1956.

### 3. Women's Opinions of Fibers in Selected Items of Clothing -

This study brings up-to-date certain information collected in 1946 on women's preferences for fibers in selected items of clothing. Data collected on each item of clothing included, women's experience with the item of apparel, fiber preference, reasons for preference, and characteristics looked for when buying. Although the study was primarily focused on cotton, certain information is available on the use of wool in the various items of clothing studies.

The analysis of the data in this study has been completed. A preliminary report was released in February 1955 and the final report is being prepared for publication and is expected to be available late in 1955.



Cotton was the preferred fiber for a majority of the items studied, ranking particularly high with users of housedresses, shorts, sleeveless blouses, aprons, summer skirts, summer slacks, and anklets. Wool was the first preference of women who used winter skirts and winter dresses.

4. Use Patterns of and Preferences for Fabrics and Fibers Among Automobile Manufacturers

This study is to obtain data on the volume of the fabrics and fibers used in the manufacture of passenger cars and to ascertain from the manufacturers their opinions about the use of these fabrics and fibers as well as their expectations as to what will be used in the future. The study will cover fibers used in the interior trim of cars. The emphasis will be on cotton and other competing fibers. However, because of the significant percentage of wool used in certain parts of the interior trim, data as to its use will be obtained.

This study is a follow-up of a prior study conducted in 1950 among automobile manufacturers.

The collection and analysis of data are now in progress and a preliminary report is expected in the late fall of 1955, with a final report available in the early part of 1956.

5. Women's Uses and Preferences for Wool and Other Fibers in Selected Items of Clothing, Home Sewing, and Needlework Crafts

This study is to ascertain for all females, 18 years of age and older, in a national sample, ownership of specific items of clothing, the fiber content of these items, preferences for fibers, and attitudes associated with the selection of these items of clothing. The items of clothing covered are suits, skirts, and sweaters. Practices associated with care and cleaning of these garments will also be ascertained. In addition, certain information will be obtained on sewing, knitting and other needlework with emphasis on the type of articles made and the fibers or fabrics used in making these articles.

The personal interviewing phase of this study is expected to be completed late this fall, and a final report is expected in the latter half of the calendar year 1956.

6. Men's Uses and Preferences Among Selected Items of Clothing

This study is to obtain data on the competitive position of cotton in relation to other fibers used in selected items of men's clothing. Data will be obtained on the various fibers used in the following items of clothing: dress shirts, summer sport shirts, slacks, dress socks, summer suits, pajamas, robes, and Bermuda shorts.



This study is similar to a prior study conducted in 1948 on men's preferences for fibers among selected items of clothing. Since that time, competition from manmade fibers has increased and it is important to ascertain consumer reactions toward these new fibers and blends of synthetic and natural fibers in these items of apparel.

Since wool is an important fiber for certain of these items, information as to its use and consumers' opinions about wool as a fiber in these items will be obtained.

#### 7. Fiber Preferences of Teenage Girls for Selected Items of Clothing

This study is to gain information on teenage girls' possession of various items of readymade clothing and the fiber contents owned, as well as preferences for and appraisal of various fibers. In addition, data will be obtained on some shopping experiences and on the mother-daughter relationship in selection of the teenage girls' wardrobe. The survey design involves a national sample of teenage girls and a subsample, randomly selected, of mothers of interviewed girls. The mothers will provide information on their own preferences for an appraisal of materials for girls' wardrobes and on the mother-daughter relationship in the selection process.

Interviewing was completed in September. The tabulations and analysis of the data are now under way.

#### E. Marketing Organization and Costs Branch - AMS

##### 1. Measurements and Analysis of Changes in Margins and Costs for Marketing Textile Products

This project is designed to show changes in gross margins and in items of cost included for cotton, wool, and other textiles and their products at each important stage in the marketing procedure; to indicate the relationship of these margins and costs to such factors as kind and size of the operating units, methods and practices of operations, and facilities and equipment used; to ascertain the relative importance, from the viewpoint of costs, of the agencies, services, equipment, and cost items involved; and to indicate means of bringing about needed adjustments.

During the last year data have been assembled to show margins and costs involved in wholesale and retail distribution of textile products. These data show that the proportion of net sales of wholesale dry goods houses that were accounted for by gross margins was greater in 1954 than for any other year since 1950. The proportion accounted for by profits before Federal income taxes was less in 1954 than for any other year since 1950. The proportion accounted for by total operating expenses was greater in 1954 than for any other recent year. Gross margins for retailers also increased. The proportion of net sales accounted for by gross margins



for womens' accessories and speciality stores, for example, increased from 32.4 percent in 1949 to 33.7 percent in 1954. Total expenses increased from 29.4 percent in 1949 to 31.5 percent in 1954 and net benefits before income taxes decreased from 3 percent to 2.2 percent during the same period.

Plans: Additional data need to be assembled and more detailed analysis made to bring up to date the information on margins and costs; to show the factors responsible for or associated with changes in these margins and costs; and to indicate means of increasing efficiency, reducing costs, and expanding market outlets for cotton and wool. Data from the census of manufacture and of business for 1954, which are expected to be available by 1956, along with data from other governmental and private sources, will supply a basis for substantial expansion in research needed relating to this project.

## 2. Price Risks for Wool and Wool Products and Means of Reducing Them

This study is designed to (1) show the nature and extent of the risks of loss and possibilities of gain from changes in prices of wool, wool top, and selected wool yarns and fabrics; (2) ascertain to what extent futures trading and alternative means afford protection by reducing or offsetting the risks of loss from price changes through hedging and other operations; (3) indicate the influence of various factors on the spot-futures-price relationships and protection afforded by futures as hedges; (4) show gains and losses from transferring hedges and from straddle transactions; (5) indicate the effects of trading in futures on fluctuations in spot prices; and (6) give some indications of the effects of futures trading and other stabilization operations on the stabilities and level of wool prices, on costs of marketing, on incomes to producers, and on costs to consumers.

The basic data for this study have been assembled and a substantial part of the analysis has been completed. Preliminary results indicate that in many instances a substantial proportion of the gains and losses from changes in spot prices could have been offset through the use of futures as hedges; that benefits from hedging in many instances could have been supplemented by the transfer of hedges and by straddle operations; and that futures trading at times tend to stabilize prices and to reduce costs of marketing.

Plans: To complete the analyses of the data assembled and to prepare the results for publication by early 1956. This will complete the research relating to this project.

## 3. Improvements in Handling and Preparing Wool At Warehouses

This study is designed to supply a basis for improving the adequacy and efficiency of warehouse operations and related services for wool by assembling and analyzing information to show (1) the nature



and extent of the handling, preparing, and other services relating to wool at warehouses of various types and the charges or costs involved; and (2) the influence of the various factors on the adequacy and efficiency of these services and on their benefits and costs. The need for the results of such research is emphasized by the fact that domestic wool is confronted by greatly increased competition from well prepared imported wool and from manmade fibers and that improvements in the adequacy and efficiency of the warehouse services appears to be a promising means of strengthening the competitive position of our wool.

Work on this project is limited mainly to the preparation of plans; assembling information relative to the name, size, and location of wool warehouses; the preparation of schedules for recording information; and preliminary discussions with leaders in the industry, including warehouse operators, handlers, dealers, and processors or manufacturers for the purpose of obtaining their suggestions with regard to the kinds of information that would be of greatest usefulness in improving the adequacy and efficiency of warehouse operations and related services for wool, the sources of the information needed, and feasible means of assembling it.

Plans: To resume this work as soon as adequate personnel can be obtained.

#### 4. Analysis of Efficiency and Costs of Manufacturing Cotton and Wool Products

This project is designed to discover the most feasible means of increasing the efficiency and reducing the costs of the services rendered in specified segments or operations of the cotton and wool manufacturing industry. The research would involve detailed analyses for representative establishments to show the influence of the various factors on the efficiency and costs of specific processes under actual operating conditions, the preparation of specifications and operating costs for low cost establishments for manufacturing specified products, and the use of the results shown under actual operating conditions and those indicated for model low cost units to indicate the most feasible means of improvement. This research would need to be developed in cooperation with operators in the industry and with the assistance of agencies well trained in cost engineering in the textile industry.

Gross margins for manufacturers and finishers of wool yarns and fabrics average almost as much as gross returns to farmers and ranchmen for producing the wool and they average about five times as much as total costs of marketing raw wool. Operating efficiency of many textile manufacturers is reported to be substantially below what it could be. Any inefficiency in the manufacture of wool may be reflected in lower incomes to farm producers of wool, higher



costs to consumers of wool products, and reductions in market outlets for wool. In light of these facts, it is highly important, from the viewpoint of manufacturers, wool producers, consumers of wool products, and the wool industry as a whole, that research of this type be developed.

PROPOSALS FOR COMMITTEE  
CONSIDERATION

1. Competitive Position of Wool and Man-Made Fiber in Specific End Uses

Expand research to analyze changes in the relative amounts of wool and man-made fiber used in the manufacture of items for which wool traditionally has been considered the most desirable raw material and the factors associated with these changes. Although some work is being done along this line, the nature and extent thereof is seriously restricted by the inadequacies of available historical data and other information. Any expansion is contingent upon an expansion of the collection of production data for the various end items. Such data is essential to a determination of the quantities of the various fibers involved.

2. Relation of Fluctuations in Retail Sales of Wool Products to Production at Earlier Stages and Relation of Prices to Buying Movements

Initiate research to determine the extent to which the contraction and expansion of inventories at the various stages of marketing, processing, manufacturing, and distribution are a factor in the extreme and somewhat erratic fluctuations in demand for raw wool, in mill consumption, and in prices. Research along this line would need to be preceded by the collection over a period of years of the information basic to the compilation of historical series on prices, production, sales, and inventories at the various stages of production and marketing.

3. Control of Insects that Infest Wool and Wool Products

(See No. 5 under UTILIZATION)

4. The Influence of Various Methods of Wool Preparation on Grade of Grease Wool and on Utility of the Processed Wool

Expand the study of Commodity Credit Corporation wool to include additional types of wool. This study is also deemed necessary to determine the adequacy of the proposed grease wool grade standards for wool prepared for market by different methods - graded, sorted, skirted or as original bag. It is also of considerable value to the entire industry to determine the influence of different methods of preparation on the utility of processed wool to manufacturers.



5. Identification and Evaluation of Physical Characteristics of Grease Wool Influencing Quality of the Processed Wool

Expand studies to identify and objectively measure the relationship of color, cimp, strength, and elasticity of grease wool to the utility of the processed wool. Fineness, length, color, crimp, strength, and elasticity are physical characteristics that are generally attributed to influencing value and utility of wool. Considerable data are available for objectively measuring fineness and length, but data on the other characteristics are very limited, particularly as relating to utility in processed items.

6. The Feasibility of Providing Producers with Grade and Yield Information Prior to Marketing

Initiate a study of the feasibility and means of providing producers with the grade and estimated yield of their wool prior to marketing. This study would be limited to relatively small geographical areas. Generally most producers are inexperienced in estimating grade and yield of wool and this service would put them in a better bargaining position with buyers.

7. The Feasibility of Expanding Market News Reporting of Wool Prices to Producing Areas

Investigate the feasibility of reporting market information on wool sales at country points. A study would be conducted in a limited area for an adequate period of time to determine the practicability of obtaining and disseminating such local market information and the value of such information in relation to the cost of the service.

Market reporting of domestic wool prices has been largely limited to the Boston market. Although market conditions at Boston may reflect the domestic wool market better than any other point, there is an apparent need for reliable unbiased market information covering sales at country points.

8. An Appraisal of Merchandising Methods and Practices Used in Retail Selling of Apparel

Initiate research to appraise merchandising practices such as space, location, promotional displays, etc., for selected items of wearing apparel contain<sup>ing</sup>/100 percent wool, mixtures of wool and synthetics, and 100 percent synthetic fibers. In addition, a selected sample of department store buyers of apparel and others dealing with customers in retail establishments will be interviewed to determine particular problems associated with consumer reactions to materials containing mixtures of synthetic fibers of 100 percent synthetic fibers. Particular problem areas dealing with the characteristics of color, fineness, etc., will be investigated.



Since World War II, an increasing share of the apparel textile market has been taken by synthetic fibers. In many instances the increased share has been at the expense of wool. It is the belief of some apparel wool manufacturers and others in the wool industry that part of the decline in wool's share of the apparel market is due to merchandising practices in retail outlets.

9. Economic Problems Associated with Off-Color Wools

Initiate work to appraise the magnitude of the problem represented by off-color wool as well as the effect of such wool on the use and price of domestic wool. A chronic problem facing wool producers, processors, and manufacturers has been the handling of stained, yellow and other off-color wool prevalent in our domestic clip. In many instances, this situation has resulted in lower prices to domestic producers and a general preference by the trade for imported wool. The problem of off-color wool in our domestic clip has become one of increasing importance in the post-war years. This is primarily due to the trend toward light colors in wool fabrics with the consequent adverse effect on the use of domestic off-color wool by the wool manufacturing industry.

Information of this kind is necessary in order to direct physical researchers in the development of processing methods which are economical. It is anticipated that the cost of treatment will vary depending on the type of chemical modification employed.

10. Fiber Preferences in Household Textiles

Initiate a consumer use and preference survey regarding the competitive position of wool and other fibers in household furnishings. Segments of the wool industry have suggested the need for a survey of homemakers' experience with and preferences for the various new and improved fibers used in selected household textile items. These products have been on the market long enough for a consumer study to yield valuable results, and it is time to find out how satisfied the consumers are who have experimented with non-wool fibers.

The continuing growth in the use of synthetic fibers in household goods partially at the expense of the wool fiber, needs current appraisal to determine changing consumer attitudes toward and preference for the various fibers. Laboratories can use the data which suggests the need for product improvement. And finally, the producer benefits when the consumer is most satisfied and uses more of his product.

11. Measurements and Analysis of Changes in Efficiency of Marketing Wool Products

Expand work on margins and costs on the basis of 1954 census data and other information to bring up-to-date and expand the available



information; to show the factors responsible for or associated with changes in margins and costs; and to indicate means of improvement.

12. Improvements in Handling and Preparing Wool at Warehouses

Expand research for improving the adequacy and efficiency of warehouse operations and related services for wool. Information will be assembled and analyzed to show (a) the nature and extent of the handling, preparing, and other services relating to wool at warehouses of various types and the charges or costs involved; and (b) the influence of the various factors on the adequacy and efficiency of these services and on their benefits and costs.

13. Analysis of Efficiency and Cost of Manufacturing Wool Products

Initiate research to discover the most feasible means of increasing the efficiency of the services rendered in specified segments or operations of the wool processing or manufacturing industry. This research would need to be developed with the cooperation of operators in the industry and with the assistance of agencies well trained in cost engineering in the textile industry.

Gross margins for manufacturers and finishers of wool yarns and fabrics average almost as much as gross returns to farmers and ranchers for producing the wool and they average about five times as much as total costs of marketing raw wool. Operating efficiency of many textile manufacturers is reported to be substantially below what it could be. Improved efficiency in the manufacture of wool, in addition to reducing costs to manufacturers, may result in higher incomes to producers of wool, lower costs to consumers of wool products, and expansions in market outlets for wool. In light of these facts, it is highly important, from the viewpoint of manufacturers, wool producers, consumers of wool products, and the wool industry as a whole, that research of this type be developed.

V. MARKETING SERVICE AND EDUCATION

A. Agricultural Estimates Division - AMS

1. Reporting and Statistical Service on Sheep and Wool

During the past year the regular statistical and reporting service work on sheep and wool continued with limited research aimed at determining the problems involved in strengthening the season average price of wool to be used in connection with the National Wool Act of 1954. Research work on estimating wool production on a clean basis was also continued.



In connection with the National Wool Act of 1954, Agricultural Estimates is responsible for estimating the average price received by farmers for use in computing the rate of the Incentive Payment for Wool. This requires substantial strengthening of the basic data on which the wool price estimates are based. Under the new program more emphasis is needed upon both the final season average price for wool and the current mid-month estimates. To strengthen the year-end estimates of season average price, the staff of the Prices Received Section of the Agricultural Price Statistics Branch has worked closely with the staff of the Commodity Stabilization Service developing plans and procedures for utilizing data from the accounts of sale filed with County ACP offices as part of the application for payment. Complete information for the year's wool sales will not be available from this source until after the close of the marketing year on March 31. As a further step in strengthening the season average price estimates, the year-end wool price and marketing survey has been expanded to include all important wool States.

To strengthen the current mid-month estimates of wool prices, arrangements have been made for the State Statisticians of Agricultural Estimates to extend their field contacts with wool handlers, dealers, and cooperative marketing agencies so as to maintain more complete and current knowledge of market developments. Also members of the staff of the Price Branch spent about a month in the field working with the Statisticians to develop supplementary wool price and marketing information, together with methods and procedures for utilizing data to become available from accounts of sale.

The Wool Research and Marketing Advisory Committee recommended that reporting should be made on a clean as well as a grease basis. In this connection it was further recommended that a check should be made on the conversion factors for transposing grease wool to clean wool, recognizing that this factor should be variable for different sections of the country. Shrinkage data by States have been assembled from the various Government wool programs. The most complete and acceptable data by States are obtained from the 1946 wool program when practically all of the domestic clip was included in the Government program. Wool program data relating to other years are less dependable for shrinkage statistics by States because of selectivity resulting from certain grades being placed under loan.

The problem of obtaining an adequate basis for estimating shrinkage concerns: (1) developing a basis for forecasting shrinkage factors by States which can be used to convert the preliminary estimates made in July to a clean basis, and (2) obtaining adequate sample data of account sales of wool showing shrinkage determined by core tests or other dependable means at the end of the season to use in connection with converting the final estimates of grease wool to a clean basis.



In regard to (1) above some preliminary work has been done in assembling results of studies of factors affecting shrinkage that have been made by the various State agricultural experiment stations. Data on shrinkage by breeds and by sex have been collected, or will be assembled, from records of the Montana Wool Laboratory and of the U. S. Sheep Experiment Station. These data will be correlated with weather factors to determine if basic positive relationships exist.

The possibility of obtaining sample data on shrinkage from account sales is being explored further. Some cooperatives and dealers have acceptable records from which samples can be drawn, but current annual records of shrinkage are lacking on a large part of the domestic clip. In recent years there has been an increasing number of wool marketing agencies that use account sales slips with provision for showing shrinkage. Thus, it may be possible at some future date to obtain a satisfactory sample, provided this trend continues or does not reverse itself. Present funds will not permit the extensive contact and sampling work on shrinkage which is needed to estimate shrinkage factors by States.

## B. Farmer Cooperative Service

### 1. Cooperative Marketing of Wool in the United States

The results of this project have been summarized in a manuscript for an illustrated educational type bulletin. The fundamentals of wool marketing; the history, organization and operations of local pools, State and regional and national wool cooperatives; and the problems, accomplishments, and possibilities of wool cooperatives are presented in the manuscript.

The bulletin will be printed and distributed in late 1955 or early 1956.

### 2. Organization and Operations of the National Wool Marketing Corporation and Affiliated State and Regional Wool Marketing Cooperatives

This service type project was initiated upon request and will be carried out in accordance with provisions of the Cooperative Marketing Act of 1926. The purpose of the study is to discover ways and means for improving the organization and operations of the cooperating wool marketing associations. Work to date has included some planning and qualitative analyses. Formal working plans have not yet been arrived at; however, it is anticipated that a study and quantitative analysis of the wants and needs of manufacturer and top-maker customers will have high priority in timing field work.

Another phase of this broad scope project that may receive early attention is the problem area dealing with scope of service and organizational set-up of wool marketing cooperatives especially in the territory States.



## C. Federal Extension Service

### 1. Wool Marketing

Two wool marketing projects are being conducted in New Mexico and Colorado. In addition, Extension specialists in Utah and Montana do some work on wool marketing along with regular livestock marketing work.

The educational program in New Mexico during last year included among other things 76 demonstrations, 24 radio broadcasts, the distribution of 6550 circular and the classification of 38,255 breeding ewes in the wool length for grade program. Results are demonstrated by the fact that program-improved flocks showed 11.6 pounds per fleece versus 8.4 pounds for non-program sheep. Reports indicate that New Mexico sheep economy has benefited from this program to the extent of \$750,000 annually.

Charles Fuller, Chairman, Wool Marketing Committee of the New Mexico Wool Growers Association says of his participation in the Extension program: "Our clean wool production --per ewe has gone up nearly 30 percent in the last 8 years and the weight of market lambs is up 8 pounds. We now sell a better and more uniform product, both wool and lamb despite drought."

In Utah the livestock and wool marketing project included work with wool pools. Three of these pool groups have requested an expansion of the educational work in the year ahead. Wool schools were held in seven counties. During the shearing season educational work was done at eight of the large shearing sheds.

In Colorado we have reports on the new one-half time marketing project in sheep and wool for six months starting July 1, 1954. The initial survey of problems indicated a lack of information on grades, prices, and the market system, as well as the weakness in contracting and the glutting of the lamb market in the fall.

In Montana 21 wool marketing pools have been organized. Expanding farm flock production creates additional demand for educational work among pool members. Producers' reports show marked difference between individual and pool prices for wool. Twelve grading demonstrations were held during the year.

In addition to the special work reported for the above States, all livestock marketing workers in other States have helped with the educational phase of the new 1954 wool law.

D. Foreign Agricultural Service

1. World Wool Situation

The world outlook for wool in 1956 is favorable. In view of the relatively high level of employment and economic activity in the major wool consuming areas of the world, a serious slump in prices appears to be unlikely. However, sharp fluctuations in prices within the season are a distinct possibility compared to the relatively stable prices of previous seasons. This is partly due to the fact that minimum prices are no longer in effect for domestic wools in the United States. Sharp fluctuations are likely, due primarily to the outlook for a continuation in the upward trend in world production coupled with the appreciable amount of pessimism evident in trade circles concerning the prospective level of world wool consumption.

The preliminary estimate of world wool production in 1955 is 4,475 million pounds, greasy basis, as compared to the revised estimate of 4,390 million pounds in 1954. Current indications are that the 1955 output may exceed the preliminary estimate.

World wool consumption in 1954 has been estimated at about 2,510 million pounds, clean basis, about 4 percent less than the previous year, but higher than in any other postwar year except 1950 and 1953. Present indications are that world consumption in 1955 will be a little above 1954.

The Australian auctions opened in September 1954 with prices about 15 percent below a year earlier and continued to ease through October. New Zealand season opened with prices of medium crossbreeds 20 percent below the previous season. Prices in the Dominion auctions fluctuate downward through February. The wool market in general remained relatively stable from March through June of 1955 with considerable strength evident in crossbred wool prices.

The Dominion wools moved into export channels at the lower prices without any build up in stocks as compared with a year earlier. The situation is somewhat different for both Argentina and Uruguay, where growers have been reluctant to sell at the world price level. Present indications are that the carry-over will be larger in each of these countries at the end of September as compared to a year earlier.



PROPOSALS FOR COMMITTEE  
CONSIDERATION

1. Improvements in Statistics and Reporting Services

Improvements needed in statistical and reporting services include:

(a) More exact measurements of year to year changes in the number of farms keeping sheep and shearing wool and the number of sheep and lambs on feed or shorn in feed lots. The sharp changes taking place make it extremely difficult to estimate accurately the changes in inventories and wool production.

(b) Decennial statistics on breeds of sheep on farms and ranches and the number of purebred sheep. A reporting service in this field would provide the State agricultural colleges, breeder associations, animal husbandmen, and other investigators with a better basis for planning breeding educational programs.

(c) Additional information on prices received by farmers for wool and more comprehensive surveys on wool marketing. The wool programs coupled with extreme variations in times of contracting and sale of wool, along with the fluctuations in the methods of sale and quantities handled by cooperatives, complicate the problem of making accurate monthly and annual price and marketing estimates. Data to become available from accounts of sale in connection with the new wool program are expected to be helpful in revising current estimates and in making final estimates of prices and marketings. However, the accounts of sale contain a fruitful source of information concerning marketing costs, and a more complete analysis than has been authorized so far would contribute greatly to improvement in price estimates and to cost and margin analysis. Suggested steps for improving the current price estimates would involve further increase in field office resources for making field contacts, developing more complete data from wool buyers and cooperatives, developing more detailed price and marketing data, and making more detail analysis of data associated with the current wool program.

(d) Determine a satisfactory basis for forecasting and estimating annual shrinkage factors by States. This will permit making estimates on wool on a clean basis, giving consideration to variations in different parts of the country.

2. Marketing Educational Program

Expand the marketing educational program for wool producers, county agents and other leaders with special emphasis on better preparation of fleeces, wool grading and its application to improve marketability, wool market requirements, the current and prospective wool situation and the educational work on the 1954 Wool Act.





